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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/614,310	07/07/2003	Jerry R. Kukulka	PD-01-946/11827 (21797-00)	8247
<div>7590      06/05/2007</div> <div>Carmen Santa Maria McNees Wallace &amp; Nurick LLC 100 Pine Street P.O. Box 1166 Harrisburg, PA 17108-1166</div>				
<div>EXAMINER</div> <div>TRINH, THANH TRUC</div>				
<div>ART UNIT      PAPER NUMBER</div> <div>1753</div>				
<div>MAIL DATE      DELIVERY MODE</div> <div>06/05/2007      PAPER</div>				

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	Application No.	Applicant(s)	
	10/614,310	KUKULKA ET AL.	
	Examiner	Art Unit	
	Thanh-Truc Trinh	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 13 March 2007.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 8-15 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7 and 16-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Election/Restrictions***

Applicant's election with traverse of 1-7 in the reply filed on 3/13/2007 is acknowledged. The traversal is on the ground(s) that "Nothing in method claim 8 would eliminate electroplating as a method for producing the solar cell structure" and "the claims are not 'independent and distinct'". This is not found persuasive because there is nothing in claim 8 mentioning about electroplating. The term "depositing" can be CVD (Chemical Vapor Deposition) or PVD (Physical Vapor Deposition), therefore it would be a serious burden on the Examiner to search for all the methods involving "depositing".

In additions, inventions I and II are related as process of making and product made. The product, solar cells structure in this case, can be made by different processes such as electroplating or epitaxially growing layers of solar cells. Therefore, these inventions are independent or distinct, and required a different field of search.

The requirement is still deemed proper and is therefore made FINAL.

### ***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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2. Claims 1, 3-5, 6, and 16-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Kressel et al (US patent 4070206).

Regarding claim 1, Kressel et al disclose a solar cell structure 10 comprising semiconductor layers 18, 22, 20 in facing contact with each other to form P-N junctions 24 and 26. (See Fig. 1, 3 and col. 2 lines 33-49). Shunts (or pocket region) 28 and 30 extend between and at least through two layers of semiconductor layers, and comprise a channel of altered material. (See Fig. 1, 3, and col. 3 lines 2-7).

With regards to "having an asymmetric current-voltage characteristic...", it has been held that a newly discovered use or function of component does not necessarily mean the system is unobvious since this use or function may be inherent in the prior art.

*Ex parte Pfeiffer* 135 USPQ 31.

Regarding claim 3, Kressel et al teach that the shunts (or pocket regions) 28 and 30 are made of the same conductivity type of one semiconductor layer but with higher dopant concentration. (See col. 3 lines 2-7). In other words, the altered material is a doped altered material.

Regarding claim 4-5, Kressel et al disclose that the solar cell comprises more than two semiconductor layers, wherein the shunt 28 extends between and at least partially through two of the semiconductor layers, and shunt 30 extends between and at least partially through three of the semiconductor layers. (See Fig. 1 and 3).

Regarding claim 6, Kressel et al disclose that the solar cell comprises plurality of channels spaced apart from each other over a front-side surface of the solar cell. (See Fig. 1 and 3).

Regarding claims 1 and 16, as seen in Figure 6, Kressel et al. disclose a solar structure comprising a solar cell 110 having two semiconductor layers 118 and 122 to form a pn junction 124, or two layers semiconductor layers 122 and 120 to form a pn junction 126; a shunt (or pocket regions 128 and 130) comprising a channel of an altered material (heavily doped semiconductor, See col. 3 lines 2-7) extending between and at least partially through the two semiconductors. The pn junction produces voltage between the two semiconductor layers when illuminated. Kressel et al. also disclose a front side metal grid (136), and a back side metallization 154. (See col. 5 lines 39-67 and entire col. 6). In regarding "a shunt... having an asymmetric current-voltage characteristic of passing a small current when voltage ...", it is the Examiner's position that since Kressel et al. teach all the structural limitations of the instant claims, the claimed properties or characteristics are inherent.

Regarding claim 17, as seen in Figure 6, Kressel et al. disclose a solar structure comprising a solar cell 110 having two semiconductor layers 118 and 122 to form a pn junction 124, or two layers semiconductor layers 122 and 120 to form a pn junction 126, wherein the pn junction produces a voltage between the two semiconductor layers when illuminated; a front side metal grid 136 (See col. 5 lines 39-60); a back side metallization

154 (See col. 6 lines 23-25); a shunt (or pocket regions 128 and 130) comprising a channel of a doped altered material (heavily doped semiconductor, See col. 3 lines 2-7) extending between and at least partially through the two semiconductors. Pocket region 128 extends between and at least partially through the two semiconductors 118 and 122, and pocket region 130 extends between and at least partially through the two semiconductors 122 and 122. The pn junction produces voltage between the two semiconductor layers. In regarding "a shunt... having an asymmetric current-voltage characteristic of passing a small current when voltage ...", it is the Examiner's position that since Kressel et al. teach all the structural limitations of the instant claims, the claimed properties or characteristics are inherent.

Regarding claim 18, Kressel et al. disclose the solar cell comprising three semiconductor layers 118, 120 and 122 (more than two semiconductor layers), wherein the shunt (or pocket regions 20 and 30) extend between and at least partially through at least two of the semiconductors layers. (See Figure 6)

Regarding claim 19, Kressel et al. disclose the shunt comprises a plurality of channels (pocket regions 128 and 130) spaced apart from each other over a front-side surface of the solar cell. (See Figure 6).

***Claim Rejections - 35 USC § 103***

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3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kressel et al in view of Merritt et al (US patent 4926083).

Kressel et al disclose a solar cell structure with a shunt that is used for transporting current comprises a channel of an altered material as described in claim 1.

Kressel et al do not teach the altered material is a proton-irradiated altered material.

Merritt et al teach that a preferable way to confine the propagating charge is proton implant by bombardment (or irradiation). (See col. 1 lines 46-55, or col. 3 lines 3-7)

It would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the structure of Kressel et al by having proton implant

on the conducting channel, because it would reduce leak in propagating current by creating a semi-insulating area surrounding the channel.

6. Claims 7 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kressel et al in view of Solar Panels website ([www-stud.fht-esslingen.de/projects/alt\\_energy/sol\\_cells/solar\\_panel.html](http://www-stud.fht-esslingen.de/projects/alt_energy/sol_cells/solar_panel.html))

Regarding claims 7 and 20, Kressel et al disclose a solar cell structure as described in claims 1 or 17.

Kressel et al do not teach interconnecting solar cells.

Solar Panels website teach interconnecting solar cells in series and parallel. (See website [http://www-stud.fht-esslingen.de/projects/alt\\_energy/sol\\_cells/solar\\_panel.html](http://www-stud.fht-esslingen.de/projects/alt_energy/sol_cells/solar_panel.html))

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the structure of Kressel et al by electrically interconnecting plurality of solar cells, because it would increase voltage output, amperage output to a desired level. In addition, the choice of putting solar cells in series or parallel, based on the effectiveness and practicality, is typical and well known.

### ***Response to Arguments***

Applicant's arguments filed 3/13/2007 have been fully considered but they are not persuasive.

Applicant argues that the prior art does not disclose "a shunt comprising a channel of an altered material..." However, this argument is not deemed to be



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persuasive because Kressel et al. describe pocket regions 28 and 30 (or 128 and 130 in the second embodiment) having a higher dopant concentration (See coll. 5 lines 1-7), and the pocket regions are used as means for carrier transfer (See col. 2 lines 61-64) to provide a short diffusion length (See col. 7 lines 9-15). It is the Examiner's position that "provide a short diffusion length" reads on the instant shunt, "carrier transfer" reads on the instant channel and "higher dopant concentration" reads on instant altered material. Therefore, Kressel et al. teach the instant limitation, and the reference is deemed to be anticipatory.

Applicant argues that Kressel et al. do not disclose the limitation of "a shunt ... having an asymmetric current-voltage characteristic of passing a small current ...". Kressel et al do teach the structural limitation of "the shunt comprising a channel of an altered material extending between and at least partially through the two semiconductor layers" as described above and as seen in Figures 1, 3 and 6, therefore the claimed characteristics are inherent. In addition, the Applicant does not show any evidence to prove the prior art products do not necessarily possess the characteristics of the claimed product. Therefore the rejection is maintained.

Applicant also argues that the combination of Kressel et al and Merritt et al. under U.S.C 103(a) is improper, and that Merritt et al. do not deal with solar cell. It is true that Merritt et al. primarily teach acoustic charge transport device, but they also teach introducing proton or doped  $n^+$  into a semiconductor material (or GaAs substrate) by proton bombardment (See col. 1 lines 21-66 and col. 3 lines 55-67 bridging col. 4 lines 1-8) or ion implantation (See col. 4 lines 56-59). In this point of view, the arts are

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deemed to be analogous, since they are all involving semiconductor material and ways of introducing different material into the semiconductor material to form a region (channel or pocket) that can manipulate the current flow. The Examiner also points out that motivation for modification need not lie in the primary reference, but may also be given by teaching references or the knowledge of one having ordinary skill in the art.

Applicant further traverse the ground of rejection of claim 7 since claim 7 incorporates the limitations of claim 1 and the limitations of claim 1 are not taught by Kressel et al. However, this argument is not deemed to be persuasive, as noted above, it is the Examiner's position that the structural limitations of claim 1 are clearly taught by Kressel et al., and the claimed characteristics of the structural limitations are inherent.

### ***Conclusion***

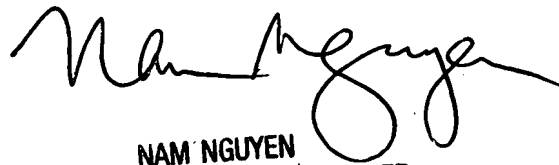
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh-Truc Trinh whose telephone number is 571-272-6594. The examiner can normally be reached on 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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5/24/07

  
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